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Beacon-Based Gaming

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Abstract:

Today, scavenger-hunt gaming applications on mobile devices navigate a player through multiple locations in a physical world via global positioning system (GPS) locating technologies. A scavenger-hunt gaming application that relies on alternate locating technologies, *e.g.*, beacons, is described. A group of beacons can be associated to a series of points of interest (POIs) of a particular venue (such as a park or museum). The group of beacons, as well as the POIs, are subsequently indexed, recorded, and either downloaded as part of the scavenger-hunt gaming application or accessed via a cloud-based gaming service. The scavenger-hunt gaming application, referencing a group of beacons specific to a venue, is capable of being played at multiple venues in the physical world.

Keywords:

Internet-of-Things (IoT), gaming, scavenger-hunt game, augmented reality, beacon

Background:

Today, with advancements in communication technologies and with computing/sensing electronics embedded in a myriad of devices, the ability for devices to collect and exchange data with one another is escalating. Devices such as smart phones, voice-recognizing personal assistants, computers, automobiles, home entertainment systems/appliances, and the like, are able to communicate with one another either directly, in a machine-to-machine environment, or indirectly over a network. Such communications and exchange of data across the myriad of devices is commonly referred to as the Internet-of-Things (IoT). The communications and

exchange of data can have purposes that include, for example, collecting usage data for vendor analytics, remote initiation/shut-down of an operating system, automating a home environment, monitoring a person's health, and so forth.

A view of an example IoT environment is represented in Fig. 1 below:

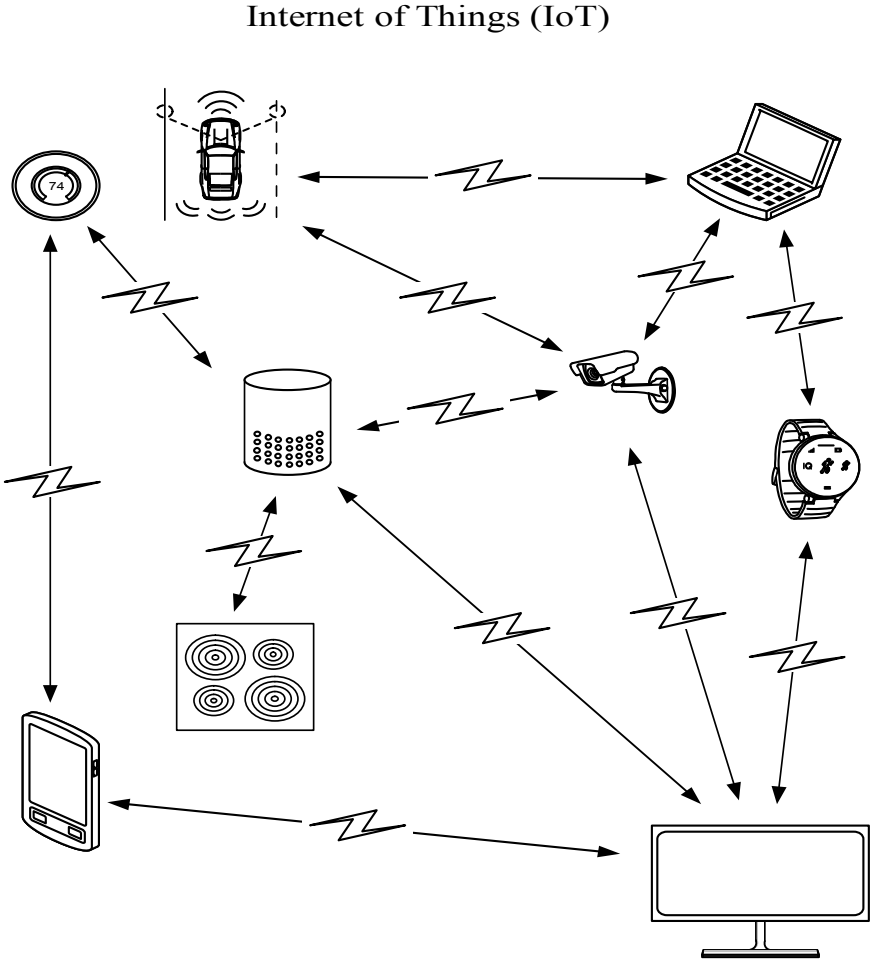

Fig. 1

In the IoT environment of Fig. 1, data may be collected by sensors of a device and shared with another device. Processing of data may be performed local to the device collecting the data or remote from the device collecting the data. Combinations of hardware (*e.g.*, sensors, microprocessors, memory), software (*e.g.,* algorithms, GUI's), and services (*e.g.*, communication

networks) may be used to sense, collect, and exchange data. Large amounts of data are expected to be exchanged, as part of the IoT, across a horizon that is developing and changing frequently.

A particular aspect of IoT includes interactive scavenger-hunt gaming applications. For these scavenger-hunts gaming applications, navigation techniques typically rely on locating technologies such as Global Positioning Systems (GPS). The use of GPS can place limitations on the scavenger-hunt games, such as requiring that a game be played outdoors in order to minimize interferences with GPS signaling. Another limitation may be that a GPS-based scavenger-hunt gaming application is "absolute", only playable at a single venue using a single group of locations or Points of Interest (POIs). An alternate technique, flexible to be used across a myriad of venues that may include indoor or outdoor locations, is needed.

Description:

Beacon technology is a locating technology that relies on a small wireless device, or beacon, transmitting a short-range signal via a low energy communication protocol such as Bluetooth Low Energy. Such a signal typically includes a universally unique identifier (UUID), which may be associated to a particular location and indexed, along with information about the particular location, as part of a database. The signal can be detected by a mobile device, such as a smart phone, a smart watch, a tablet, or the like, and, when detected, serve to indicate that the mobile device is proximate to the particular location associated to the beacon. Furthermore, a group of beacons, when distributed amongst several locations, can be used for indoor or outdoor navigation purposes, serving to identify a series of locations that are searched for as part of a scavenger-hunt game.

A general overview of a scavenger-hunt gaming application that relies on a group of beacons for identifying a series of locations is depicted in Fig. 2. As illustrated, a player uses a mobile device onto which the scavenger-hunt gaming application has been downloaded to search for each of a group of three beacons. The group of beacons, each beacon having a UUID, may be downloaded to the mobile device during downloading of the scavenger-hunt gaming application or, alternatively, may be accessed "real-time" via a wireless network (such as 3G/4G LTE, Wi-Fi, etc.) during play of the scavenger-hunt game from a cloud-based gaming service. As the player nears proximity of a first location having a first beacon, the mobile device detects the UUID of the first beacon and, in response, is caused by the scavenger-hunt gaming application to present the player the first prize of the scavenger-hunt game (cache #1).

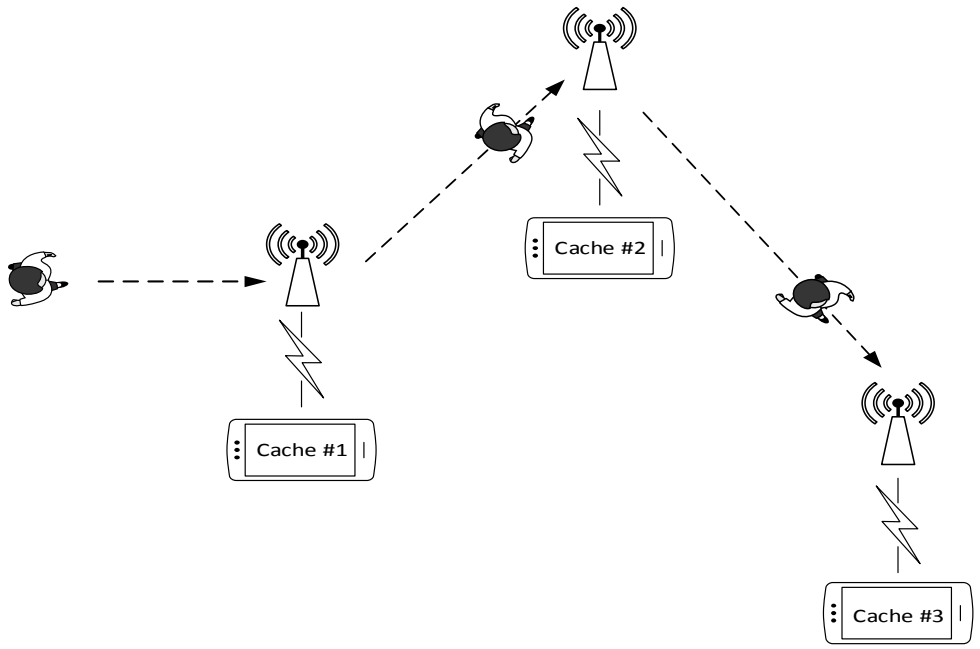

Fig. 2

After acknowledging receipt of the first cache (via an input to the mobile device), the player continues to search for the second beacon (cache #2) and the third beacon (cache #3).

Such a scavenger-hunt gaming application is portable across multiple venues. For example, a developer of the scavenger-hunt gaming application may wish for the scavenger-hunt game to be played at Dodger Stadium, The Louvre, or in Central Park. In order to support multiple-venue play, the developer simply associates a group of beacons at a venue (indexed to specific points of interest (POIs) at the venue) to a shared code specific to the venue.

For instance, to set up the scavenger-hunt game to be played Dodger Stadium, the developer may associate a first beacon located near a Dodger Dog stand, a second beacon located near a left-field grandstand, and a third beacon located near a peanut vendor behind home plate to the shared code "DODG". Likewise, to set up the same scavenger-hunt game to be played at The Louvre, the developer may associate a fourth beacon located near the Mona Lisa, a fifth beacon located near the Venus de Milo, and a sixth beacon located near the Winged Victory of Samothrace to the shared code "LOUV". As part of the process associating the beacons to their respective shared codes (*e.g.*, beacons 1-3 to "DODG" and beacons 4-6 to "LOUV"), UUID's for each beacon are recorded and indexed.

After initiating the scavenger-hunt gaming application on the mobile device, the player may input the shared code corresponding to the venue at which he wishes to play the game. In accordance with the present instance, if the player is at Dodger Stadium, he inputs the shared code "DODG", after which the scavenger-hunt game commences and the player begins exploring the stadium. The scavenger-hunt gaming application, in effect, causes the mobile device to begin searching (sequentially, if desired by the game developer) for beacons 1-3.

Scavenger-hunt gaming applications having even more interaction with the player, relying on beacon-based locating technologies, are possible. For example, a scavenger-hunt gaming application may include interactive pre-rendered characters, utilize additional indexed information

specific to the venue at which the scavenger-hunt game is being played, and augmented reality to enhance the player's experience. Examples of a scavenger-hunt gaming application directed to these interactions will be illustrated in Figs. 3-5.

As illustrated by Fig. 3, and after initiation of a scavenger-hunt gaming application, a pre-rendered interactive character is displayed by the mobile device. Based on a shared code that is specific to the venue and has been input by a player, the scavenger-hunt gaming application determines that an initial location the player must search for at the venue is "Bldg. B Barista". In this example, the pre-rendered interactive character verbalizes (via a speaker, earpiece, or other audible mechanism associated with the mobile device) that the player must proceed to the "Bldg. B. Barista" for the cache or next clue. A textual rendering of the clue is also presented on a display screen of the mobile device.

Fig. 3

As illustrated in Fig. 4 below, and after detecting the indexed beacon that is proximate the "Bldg. B. Barista", the scavenger-hunt gaming application causes the mobile device to enter an augmented-reality mode. Presented, via a display of the mobile device while the player is scanning the location with the mobile device, is an augmented-reality cache which the player must select so

that the scavenger-hunt game can continue (in this particular example, a decoder machine that has been requested by the interactive character).

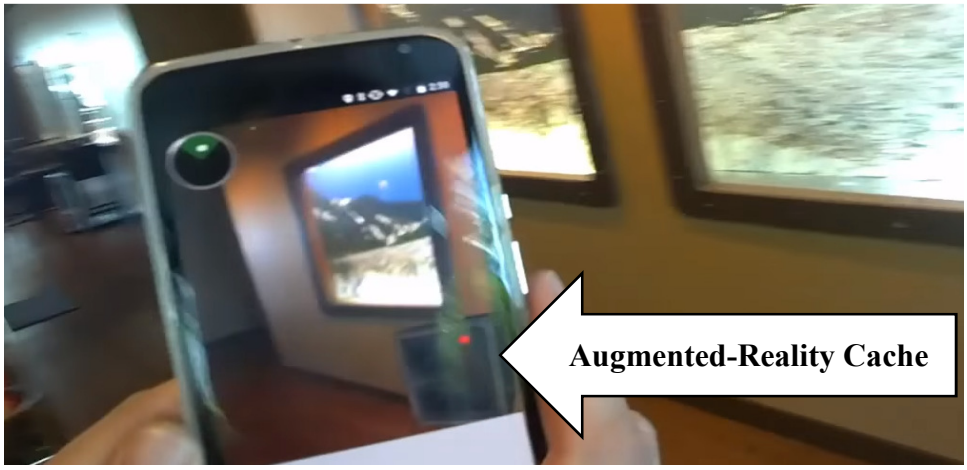

Fig. 4

As illustrated in Fig. 5, the scavenger-hunt gaming application causes the mobile device to present the player with the next clue or location at the venue for which to search. In this particular example, the mobile device prompts the player to search for the "Pier 36 Color Printer" for the next cache or clue.

Fig. 5

If the player plays the scavenger-hunt game at a different venue, such as The Louvre, the pre-rendered interactive character and augmented reality cache remains the same. However, specific locations at The Louvre are now used as part of the scavenger-hunt game (*e.g.*, the Mona Lisa may replace "Bldg. B. Barista" and the Venus di Milo may replace the "Pier 36 Color Printer"). This affords the scavenger-hunt gaming application to not only be an entertainment mechanism, but also an enhanced tour guide for a specific venue.